

Wheelchair

This invention concerns improvements in or relating to wheelchairs.

A number of problems are often encountered with existing wheelchairs. These include that the wheelchairs are generally not very comfortable and particularly bearing in mind that users may sit on them for very long spells. It would be desirable for the wheelchair to be reclinable, though this can be problematic as this tends to make a wheelchair unstable. Difficulties are also often encountered by wheelchair users when transferring from a wheelchair to an adjacent car. This is particularly due to the generally large rear wheels which come between a user and a car such that the user has to manoeuvre therearound. Also, wheelchairs are often relatively wide, and a significant part of this width may be in addition to the width of the seat. This can cause problems if the user wishes to go through a doorway. Also, wheelchair seats are often not wide enough for larger patients.

According to the present invention there is provided a wheelchair with a seat with a reclinable backrest, the wheelchair being arranged such that as the backrest is reclined the rear wheels of the wheelchair are automatically moved rearwardly to compensate for the rearward movement of the user's centre of gravity, and when the backrest is returned to a more upright position the rear wheels are automatically moved forwards.

The backrest is preferably pivotally mounted relative to the rest of the seat.

The wheelchair preferably includes means for selectively locking the backrest in a required position, and the locking means are preferably releasable by a person on the wheelchair and/or a person pushing the wheelchair. The locking means are preferably automatically engageable following release.

The locking means may comprise a ratchet arrangement, and desirably

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with a locking member engageable with a ratchet wheel. One of the locking member and ratchet is preferably mounted on the backrest and the other on a fixed part of the wheelchair, which fixed part may comprise part of the seat.

Alternatively, the locking means may comprise one or more actuatable cylinders, which cylinder or cylinders is preferably arranged to return the backrest to a fully upright position.

The rear wheels of the wheelchair may each be slidably mounted on respective in use generally horizontal first tracks. A connection arrangement is preferably provided extending between each rear wheel and the backrest.

Each connection arrangement may be engageable with a member on the opposite side of the pivotal mounting of the backrest, and may be engageable with extensions from the backrest. Each bracket extension may be removably engageable between two abutment members. The abutment members may be slidably mounted on a second track and at least a one of the abutment members may be sprung.

Each connection arrangement preferably converts movement of the abutment members in one direction to movement of the rear wheels in an opposite direction. The abutment members may be mounted on a first carriage which is pivotally connected to a pivoted link member on one side of the pivotal mounting of the link member, and which link member is connected on the opposite side of the pivotal mounting to the wheel. Each link member is preferably connected to the respective wheel by a generally horizontally slidable member. The rear wheels are preferably mounted on respective mounting assemblies, and desirably removably, and the mounting assemblies are preferably connected to the respective slidable members.

Handbrake arrangements are preferably provided for the rear wheels which are connected to the wheel mounting assemblies so as to be movable therewith. Adjustment means are preferably provided for the handbrake

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arrangements.

Alternatively, the rear wheels of the wheelchair may each be mounted on an elongate support member which is pivotally mounted to the wheelchair and also connected to the backrest, such that reclining of the backrest causes rearwards pivotal movement of the support members.

The support members may be mounted about respective in use substantially horizontal axes. The support members may be cranked, and may be cranked generally adjacent the pivotal mounting and/or the rear wheels.

The connection between the support members and backrest may be provided by a strip which is desirably flexible, and which strip may be pivotally and/or removably mountable on the support members and/or backrest.

The rear wheels may be mounted by a suspension arrangement, and the suspension arrangement may comprise a resilient member such as a spring or block of rubber. The rear wheels may be each mounted on a pivotal member, and the resilient member may engage with the pivoted member. Each pivoted member may be pivotally mounted on a respective support member, with the respective resilient member engageable between the support member and pivoted member.

The invention also provides a wheelchair with wheel mounting assemblies for each of the rear wheels, the assemblies comprising locking members selectively engageable to lock the wheels on the respective assembly.

The locking members are preferably operable by a person on the wheelchair and/or a person pushing the wheelchair.

The locking members may be selectively engageable with bearing members which rotatably mount the wheels, the bearing members being releasable with the wheels from the wheelchair.

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A groove may be provided around the bearing members in which the respective locking member is selectively engageable. The engageable part of the locking members may have a generally U-shape configuration.

The wheelchair preferably provides stub axles upon which the bearing members are releasably mountable. The stub axles are preferably arranged such that when the bearing members locate thereon the wheels extend outwardly beyond the stub axles.

The stub axles are preferably mounted on second carriages movable along said first tracks. The locking members are preferably mounted on said second carriages. The locking members are preferably slidably movably mounted on said second carriages to be movable towards or away from the bearing members and may be pivotally connected to respective operating handles such that pivotal movement of the operating handles causes the respective locking member to slide in or out of engagement with the respective bearing member.

A plurality of mounting positions for the stub axles on the second carriage may be provided, and said positions may be defined by a plurality of mounting holes. The height of the first tracks on the wheelchair may be adjustable.

The wheelchair may comprise one or more temporary ground engagement arrangements, which are selectively ground engageable towards the rear of the wheelchair to permit one or both of the rear wheels to be removed whilst a person remains supported on the wheelchair.

A temporary ground engagement arrangement is preferably provided on each side of the wheelchair.

The temporary ground engagement arrangement may be operable by a person on the wheelchair and may comprise a ground engagement member

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connected to a threaded member which can be screwed down until the ground engagement member is ground engaging. The ground engagement member may comprise a wheel, which wheel is significantly smaller than the rear wheels of the wheelchair.

The wheelchair may comprise a third wheel arrangement for climbing curbs and the like, and the third wheel arrangement may be arranged to be selectively ground engaging to permit a rear wheel to be removed with a person on the wheelchair.

The invention also provides a wheelchair in which the height of the front wheels is adjustable.

The front wheels may be mounted on a carrier member which is slidably mounted in a channel, with means for locking the carrier member relative to the channel. A slot or slots and/or alignable holes may be provided in a wall or walls of the channel and/or the carrier member.

The arm rests of the wheelchair are preferably selectively removable and may be pivotally movable in a substantially vertical plane.

The invention yet further provides a wheelchair with arm rest arrangements including arm rests and side curtains selectively extendible downwardly from the arm rests.

Means may be provided for retaining the side curtains extending downwardly, and the retaining means may include fastening means such as strips of fleece and hook fastener towards the free end of the side curtains, with corresponding fasteners on the wheelchair.

The side curtains may be mounted around rollers located in the arm rests. The rollers may be spring urged to roll up the side curtains.

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The invention still further comprises a wheelchair comprising two side frames interconnected by a foldable front and rear assembly such that the side frames and foldable assembly can lie substantially flat on each other.

The foldable assembly is preferably pivotally connected to the side frames, with the assembly comprising two parts joined by a generally central vertical hinge such that in an in use condition the assembly extends in a generally planar configuration between and generally normal to the side frames, and in a folded condition the assembly is folded to lie substantially parallel to the side frames.

Front and rear foldable assemblies may be provided, and which are preferably arranged so that when being moved towards a folded condition the central hinges move towards the other of said assemblies.

The front assembly preferably mounts the front wheels of the wheelchair. The rear assembly is preferably spaced from the rearmost part of the wheelchair so this does not obstruct the feet of a person pushing the wheelchair.

Alternatively, a foldable assembly may be provided, which may extend generally horizontally in use, and may locate beneath the wheelchair seat.

The foldable assembly or assemblies may be adjustable in size to vary the spacing between the side frames. The central hinges may be slidably movable relative to the remainder of the assemblies on each side thereof to space said remainders apart.

The wheelchair seat is preferably removably mountable on the wheelchair to extend between the side frames, and may be releasably lockable in position. A plurality of different widths of seat may be provided usable with the wheelchair with the widths of the front and rear assemblies differently adjusted.

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Embodiments of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view of a first wheelchair according to the invention in an in use condition;

Fig. 2 is a similar wheelchair to that shown in Fig. 1 in a partially folded condition;

Fig. 3 is a diagrammatic perspective rear view of the seating arrangement of Fig. 1;

Fig. 4 is a diagrammatic side view of part of the wheelchair of Fig. 1;

Figs. 5 and 6 are diagrammatic perspective views of different parts of the wheelchair of Fig. 1;

Fig. 7 is a diagrammatic end view of part of the wheelchair of Fig. 1;

Figs. 8 and 9 are respectively diagrammatic side and plan views of a further part of the wheelchair of Fig. 1;

Figs. 10 and 11 are respective cross-sectional side and end views along the lines B-B and A-A in the other figure where still further part of the wheelchair of Fig. 1;

Fig. 12 is a diagrammatic front view of part of the wheelchair of Fig. 1;

Figs. 13 and 14 are respectively similar views to Fig. 1 of second and third wheelchairs according to the invention;

Figs. 15-17 are respectively side, rear and plan views of a fourth wheelchair according to the invention;

Fig. 18 is a view from below of the wheelchair of Fig. 15; and

Figs. 19 and 20 are respectively front and rear perspective views of the wheelchair of Fig. 15.

Figs. 1 to 12 of the drawings show a wheelchair 10 comprising side frames 12 interconnected by front 14 and rear frames to be described in detail hereinafter. Each side frame 12 mounts a rear wheel 16 on a first track 18. A seating arrangement 20 (Fig. 3) is removably mounted on the side frames 12 to extend therebetween. Sprung fingers (not shown) operable by cables connecting to an operating handle selectively engage in openings (also not shown) towards the top of the side frames 12.

The seating arrangement 20 comprises a main seat 22 with a backrest 24 which is reclinable relative thereto. Two fingers 26 extend upwardly from the main seat 22 on either side thereof towards the rear. The backrest 24 is pivotally mounted towards its base between said two fingers 26. Ratchets 28 are provided on each of the fingers 26, and a respective pawl 30 is provided on each side of the backrest. The pawls 30 are spring urged to engage with the ratchets 28 and are provided with operating means (not shown) to permit disengagement thereof. The operating means are arranged to be operable by a person sitting on the wheelchair 10 and/or a person pushing the wheelchair 10.

Elongate members 32 are provided extending for about half of the length of each side of the backrest 24 and extending downwardly therebeyond to provide free ends 34. The free ends 34 are engageable with a connecting arrangement 36 such that rearward pivotal movement of the backrest 24 causes rearward movement of the rear wheels 16 along the first tracks 18 to compensate for the centre of gravity of a person on the wheelchair 10 moving rearwardly. As the connecting arrangement 36 is the same on each side only one side will be described.

Each connecting arrangement 36 comprises a second track 38 in which a carriage 40 is mounted. The carriage 40 mounts two abutment members 42 spaced a short distance from each other, and the forwardmost one of which is spring 43 urged. The carriage 40 is arranged such that the free end 34 extends between the abutment members 42 such that movement of the backrest 24 causes movement of the carriage 40.

1 st 99 The carriage 40 also includes a projection 44 which is forward of the abutment members 42 and which projection 44 extends through a slot 46 in a pivoting connecting bar 48. On the opposite side of the pivoting of the connecting bar 48 is a further slot 50 which mounts a projection 52. This projection 52 is mounted on an elongate bar 54 which is mounted on the side frames 12 to be slidably movable in a substantially horizontal direction. At the rearward end of the bar 54 is a projection 56 which locates in a substantially

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vertical slot 58 in an upwardly extending member 60 provided on a second carriage 62. The second carriage 62 is slidably mountable in the first track 18 and mounts the rear wheel 16.

The second carriage 62 comprises a mounting plate 64 with a plurality of holes which permit the wheel 16 to be mounted in a required position dependent on the size of a person to be carried. The wheel 16 is mounted in a respective one of the holes by the following manner. A stub axle 66 is mounted to extend from the plate 64 by a retaining nut 67 so as to extend through the respective hole. The wheel 16 is rotatably mounted on a bearing 68, which bearing 68 comprises a groove 70 around its innermost part. The wheel 16 and bearing 68 are pushed onto the stub axle 66 and a sprung locking plate 72 engages in the groove 70 to hold the wheel bearing 68 on the stub axle 66. The wheel 16 can now rotate about the bearing 68.

The locking plate 72 is slidably mounted on the carriage 62 by two overlapping guides 74. The end 76 of the plate 72 which engages with the bearing 68 has a generally U-shape configuration to engage with a substantial part of the bearing 68. The opposite end of the locking plate 72 pivotally mounts a handle 78 which is pivotally mounted a short distance away to the carriage 62. Downward movement of the handle 78 causes upward sliding of the locking plate 72 and release of the bearing 68 and hence wheel 16. The plate 72 is spring urged into engagement with the bearing 68.

A handbrake arrangement 80 is also provided for the wheel 16 engageable with the interior face of the outside of the wheel 16. The handbrake 80 is of conventional arrangement and is linked by a connecting bar 82 to a handle on the carriage 62. The connecting bar 82 has a fine adjustment provided by a break in the connecting bar 82 connected respectively by right hand 86 and left hand 88 threads connecting into an elongate adjustment nut 84. As the handbrake 80 moves with the carriage 62 it does not require any further adjustment even when the wheel 16 is moved. The vertical position of the first track 18 on the side frame 12 is adjustable to again suit the size of a

person being carried.

Fig. 8 shows a further feature of the invention in that the height of the front wheel 90 is adjustable. This allows for compensation relative to the chosen height of the rear wheel 16 to prevent the wheelchair 10 operating at a tilt. An open channel 92 with a slot 94 on each side thereof is provided at the lower end of each side frame 12. A length of rectangular section tube 96 extends upwardly from the front wheel 90 and is slidably locatable in the channel 92. The tube 96 can be locked at a required position in the channel 92 by nut and bolts extending through the slots 94 and respective one or ones of holes 98 extending through the tube 96.

Figs. 10 and 11 show a still further feature of the wheelchair 10, a novel arm rest arrangement. The arm rests 100 are removably mountable on the side frames 12 by virtue of a bracket 102 locatable in an appropriate recess 104 on the side frame 12. The arm rest 100 comprises a main body 106 pivotally mounted on the bracket 102. The main body 106 has a generally n-shape cross-section with closed ends, and which broadens upwardly.

Located within the arm rest 100 is a retractable side curtain 108 of a waterproof material. The curtain 108 is mounted on a roller 110 which is spring urged to roll the curtain 108 into the arm rest 100. Strips of fleece and hook fastener 112 are provided on the free end of the curtain 108 to permit it to be retained by corresponding strips at the top of the side panels 12. This permits the side curtains 108 to be raised and lowered as required. This also permits wider persons to be accommodated on the same width of wheelchair as the side curtains 108 are flexible and would therefore not cause the discomfort that conventional rigid sides might.

Fig. 12 diagrammatically shows the arrangement of the front frame 14 of the wheelchair 10, and the rear panel would have a similar configuration. The rear panel is spaced some way forwards of the rearwardmost part of the wheelchair 10 so as not to obstruct the feet of a person pushing the wheelchair

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10. The front frame 14 comprises left 116 and right 118 parts which are each pivotally mounted to a respective side frame 12. A central hinge 120 is provided between the two parts 116, 118. The hinge 120 is mounted by upper 122 and lower 124 brackets one on each side, which are slidably lockably mounted on respective ones of these two parts. Accordingly as shown in Fig. 12 the front frame is at its minimum width, and if it is required to increase the width the brackets 122, 124 are slid relative to the two panels 116, 118. The brackets 122, 124 are mounted by two projections 126 extending through slots in the side panels.

The wheelchair 10 thus described can be used in the following manner. The wheelchair 10 will be initially set dependent on the intended user. The height of the track 18 will be set dependent on the person's height and particularly the length of their legs below the knee. The respective mounting hole for the rear wheels 16 will be chosen dependent on the upper leg measurement of the person to be carried. The width of the front 14 and rear frames will be set dependent on the width of the user. Once all these settings have been made an appropriate seat will be fastened onto the wheelchair 10 and the wheelchair 10 can be used in a conventional manner.

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If it is desired to recline the backrest 24 of the seat 20 this can be done by releasing the pawls 30. As the backrest 24 moves rearwardly the free ends 34 will move forwards urging the carriage 40 along the track 38. This causes pivoting of the arm which causes rearward movement of the bar and hence carriage along the first track. This ensures that the reclining person will not overbalance rearwardly. Obviously the backrest 24 can be moved forwards in an opposite manner.

With this wheelchair 10 the rear wheels 16 can readily be removed by pressing the handles 78 downwardly. As the axles 66 do not extend beyond the wheels 16 this provides for a narrower configuration than conventional wheelchairs which can be useful when negotiating narrow doorways and the like. When the wheelchair 10 is not required to be used the seat can be

removed and the front 14 and rear frames folded along the line shown in Fig. 2. This provides for a very compact arrangement which is thus easier to handle and store. As noted above the wheelchair 10 provides for greater adjustability than is conventional, therefore providing a more suitable and adaptable arrangement.

Fig. 13 shows a similar wheelchair 128 except that this provides for a temporary ground engagement arrangement 130. This arrangement 130 comprises a small rear wheel 132 mounted at the free end of a cranked arm 136 which is pivotally mounted on the side frame 138 and spring urged upwardly. A threaded bar 140 engages with the arm 136 and extends upwardly to adjacent the seat at which upper end a foldable handle 142 is provided. Rotation of the handle 142 in a required direction urges the rear wheel 132 downwardly to be ground engaging thus permitting the person on the wheelchair 128 to remove the respective side wheel 16 whilst still be supported.

The wheel 16 is removed by releasing the locking plate 144 using the handle 146 from the bearing 148. This arrangement could be particularly useful in transferring between a wheelchair and an adjacent car or other location. A similar arrangement can readily be provided on both sides of the wheelchair 128.

Fig. 14 shows a wheelchair 150 similar to the wheelchair 10 shown in Fig. 1 except with a kerb or the like climbing arrangement 152 as disclosed in the applicant's co-pending U.K. Patent Application No. 9908736. In this instance the rearmost wheel 154 can be urged to be ground engaging to permit the main rear wheel 16 or wheels to be removed with the person still supported by the wheelchair 150 as described above.

Figs. 15-20 of the drawings show a further wheelchair 200 again comprising two side frames 202. Each side frame 202 comprises lower and upper cross members 204, 206 interconnected by a generally vertical rear upright 208 and a forwardly inclined front support member 210. A front wheel

212 on a castor arrangement 214 is provided at the lower end of each front support member 210.

An arm rest member 216 extends on top of the upper cross member 206 for a substantial part thereof. The rear end of the arm rest members 216 extends rearwardly beyond the upper cross members 206 to each mount part of a rearwardly inclined handle 218 extending from the lower cross member 204, which handle 218 has a generally n-shape. The handle 218 is removably mounted on the arm rest members 216 and also lower cross member 204, so as to be removable to enable the wheelchair 200 to be moved to a stowed condition.

As well as being interconnected by the handle 218, the two side frames 202 are also interconnected by a pair of plates 220 which extend generally horizontally in use and are pivotally connected by hinges 222 to locate beneath a seat part of the wheelchair. The plates 220 are provided with an overcentre locking such that they incline slightly downwardly in an in-use condition. In a stowed condition the plates 220 can be pivoted relative to each other so as to point upwards and allow the two side frames 202 to be pushed together. The side frames 202 are also interconnected by a front plate 224 located just above the front wheels 212. The front plate 224 is removably mounted to permit the wheelchair 200 to fold to a stowed condition.

A seating arrangement 226 is removably locatable on the wheelchair 200 to extend between the side frames 202. The seating arrangement 226 comprises a main seat 228 with a reclinable backrest 230. The main seat 228 has laterally extending pins 232 on each side which locate in an upwardly open slot 234 formed in a plate 236 mounted towards the lower end of each rear upright 208. The main seat 228 and backrest 230 are pivotally interconnected, and a plate 238 extends downwardly and rearwardly from the bottom of the backrest 230 on each side thereof. The plates 238 each mount one end of a respective gas cylinder arrangement 240, the other end (cylinder end) of which is mounted to the respective front support member 210 adjacent the front

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underside of the plates 220.

A cranked connecting bar 242 is pivotally mounted to each rear upright 208 adjacent the upper end thereof. The connecting bar 242 is cranked from the pivotal connection to a mid portion which in a rest position lies generally parallel to the front support members 210. The connecting bar 242 is further cranked rearwardly to extend via a suspension arrangement 244 to mount a stub axle 246 of a respective rear wheel 248. A flexible strap 250 removably extends between a generally central point of the mid portion of the connecting bar 242 and a point on the backrest 230, with pivotal movement of the strap 250 being permitted at each end.

To recline the backrest 230, the gas cylinder 240, which has a locking arrangement as is conventional, is operated by a control (not shown) towards the free end of one of the upper cross members 206, to release pressurised gas from one side of the cylinder 240 to the other. This allows the backrest 230 to be pushed rearwardly by a person sitting on the seating arrangement. To enable the backrest to be automatically returned to an upright position, the control is again operated causing pressurised gas in the cylinder 240 to return to said one side.

The handle 218 is arranged as an emergency stop for the backrest 230 to prevent reclining beyond a particular amount. The handle 218 is also arranged such that the wheelchair 200 is difficult if not impossible, to push if the backrest 230 is fully reclined on to the handle 218. Reclining of the backrest 230, by virtue of the straps 250, causes the connecting bar 242 to be pivoted rearwardly and hence the wheels 248 to be moved rearwardly to compensate for the centre of gravity of a user being moved further back.

The suspension arrangement 244 comprises a cranked bar 252 pivotally extending from the connecting bar 242 a short distance from the end thereof, and which cranked bar 252 removably mounts at its free end the stub axle 246 of the wheelchair wheel. A cylindrical piece 254 of rubber extends between the

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free end of the connecting bar 242 and the cranked bar 252 to provide a resilient suspension arrangement to absorb shocks transmitted through the wheel 248 which would otherwise be borne by a person using the wheelchair 200.

The rubber piece 254 is detachably mountable to the connecting bar 242 by a bolt 256 which also passes through the cranked bar 252. When the wheelchair 200 is to be stowed, the rubber piece 254 is detached from the connecting bar 242, and the cranked bar 252 and hence piece 254 are folded forwards such that the bar 252 lies generally parallel to the front support members 210, thereby providing a more compact arrangement.

There is thus described an alternative arrangement for automatically moving a wheelchair wheel as the backrest is reclined. In this instance pivotal rather than sliding movement is used. With this configuration whilst the relative height of the rear wheels differs slightly during reclining, the amount of difference is relatively small and thus does not significantly affect use of the wheelchair. Rather than being removable, the front plate and/or handle may be provided with a folding arrangement.

Various other modifications may be made without departing from the scope of the invention. For instance, different means may be provided for providing temporary ground engagement whilst the rear wheel or wheels are removed. It may be that a different combination of the features described above will be required in a wheelchair. A different connection arrangement could be used. A different arrangement for mounting the front wheel may be provided.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

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